United States Patent [19]

Mann

[11] **3,727,448**

[45] **Apr. 17, 1973**

[54] **INDIRECT EXTRUSION**

[75] Inventor: **Alfred W. Mann,** Rockwall, Tex.

[73] Assignee: **Texas Aluminum Company, Inc.,** Rockwall, Tex.

[22] Filed: **Jan. 20, 1971**

[21] Appl. No.: **108,132**

[52] **U.S. Cl.** **72/255**

[51] **Int. Cl.** **B21c 23/00**

[58] **Field of Search** 72/255, 273

[56] **References Cited**

UNITED STATES PATENTS

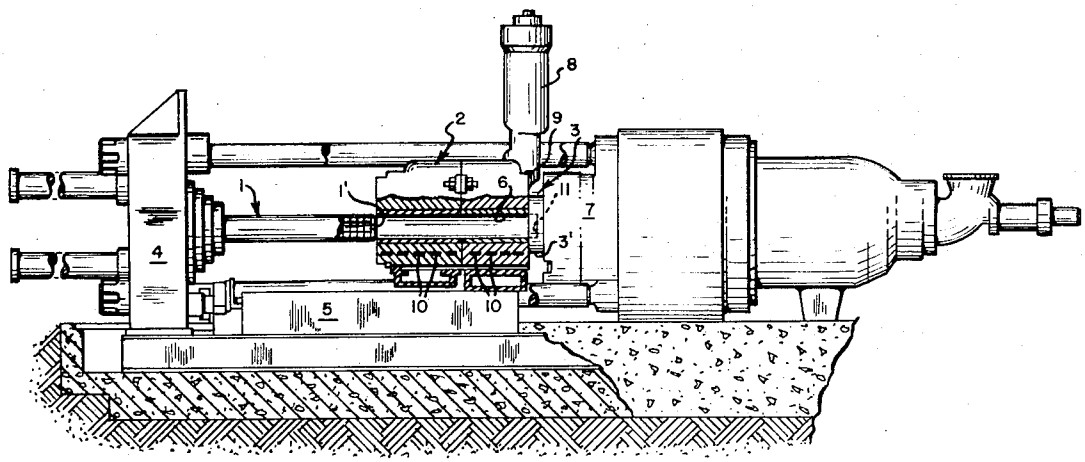
1,661,594	3/1928	Boun	72/273
2,097,502	11/1937	Southgate	72/273 X
3,018,885	1/1962	Trautman	72/255
3,369,384	2/1968	Beneke	72/273 X
3,563,079	2/1971	Monie	72/273 X
2,858,017	10/1958	Kent	72/255

Primary Examiner—Charles W. Lanham
Assistant Examiner—R. M. Rogers
Attorney—Pennie, Edmonds, Morton, Taylor and Adams

[57] **ABSTRACT**

An improved gag member for an indirect extrusion apparatus wherein a billet material is held within an open ended container with a die at one end of the container and the gag member at the other end; the gag member being used to move the container over the die and the billet material through the die. The improved gag member has a front face engaging the end of the container; and a cavity is formed in the front face in alignment with the bore of the container. In an extrusion operation, billet material is held in the cavity of the gag member and the entire amount of material held in the container is extruded through the die member.

15 Claims, 3 Drawing Figures



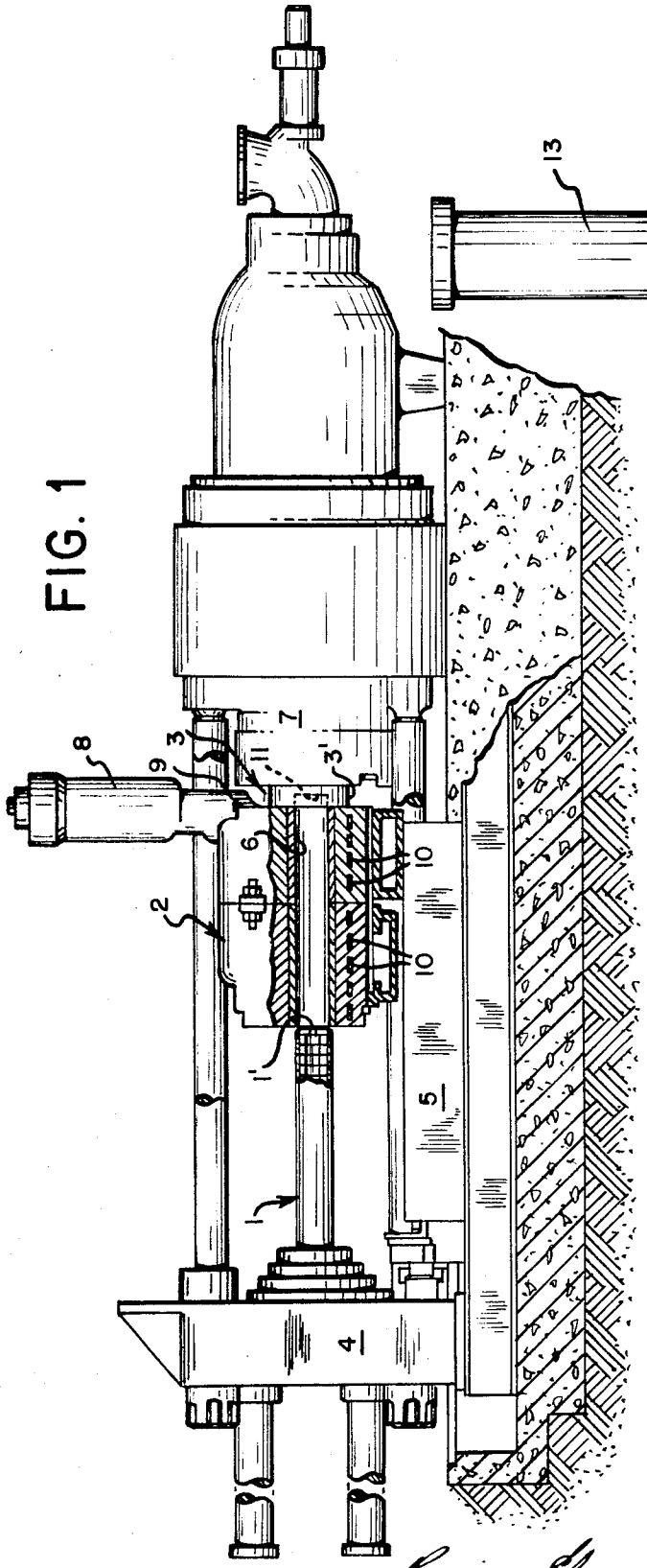


FIG. 1

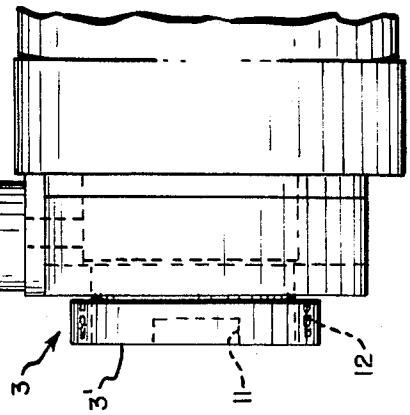


FIG. 3

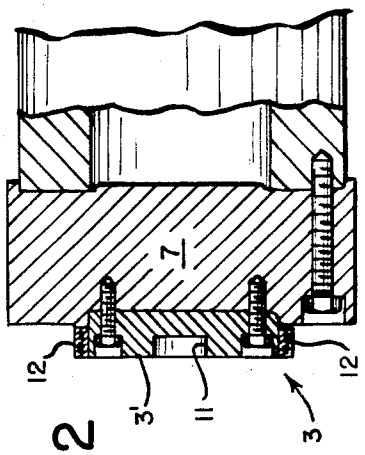


FIG. 2

INVENTOR
Alfred W. Mann
BY
Pennie, Edmonds, Morton, Taylor & Adams
ATTORNEYS

INDIRECT EXTRUSION

BACKGROUND OF THE INVENTION

With presently constructed indirect extrusion presses, billet material is extruded through a die means held in a die assembly positioned at one end of the container into which the billet material is loaded. The container is an open ended container and a gag means is provided at the end remote from the die means for closing the bore of the container. This gag means is typically mounted on the end of a hydraulically actuated ram and is used to telescope the container over the die assembly and the billet material held therein is, thus, extruded through the die means.

With conventional indirect extrusion presses, the entire billet held in the container is not extruded. Instead, the extrusion process is stopped before the die means reaches the gag member. This is done so as to prevent damage to the die means which might otherwise occur if the extrusion were to continue until the gag means struck the die means. Also, the billet is not completely extruded because the flow pattern of the material in the billet changes drastically as the final amount of material is extruded. More particularly, during extrusion of a billet of material, the material immediately behind the die flows. This flow results from material around the edges of the billet being forced toward the openings in the center of the die means. Generally, the flow pattern which is produced extends backwardly into the billet material for only a short distance. As the extrusion proceeds and the die and gag means approach each other, the room required for the normal flow of material behind the die means is decreased and eventually eliminated. As this occurs, the pressure needed for effecting extrusion of the final portion of the billet material increases greatly as does the flow pattern; and this generally results in distortion of the product being extruded.

In view of the above, it has been the general practice to stop the extrusion before the die and gag means contact each other to leave a butt of billet material in the container. This, in turn, requires that the butt be removed from the container and severed from the extruded product before the next extrusion operation may be started. The butt material from the extrusion is then reprocessed and used to form new billets. With conventional indirect extrusion presses as described above, the production of the butt during each extrusion operation and the necessity of reprocessing this material before it can be used adds to the overall cost of the extruded products.

SUMMARY OF THE INVENTION

In accordance with the teachings of the present invention, the indirect extrusion apparatus and, in particular the gag means thereof, has been modified in construction so as to eliminate the production of the butt after each extrusion operation. To effect this result, the gag means is provided with a cavity aligned with the bore of the container. This cavity is adapted to receive billet material and is of sufficient shape to absorb the normal flow of billet material so that the entire material held in the container may be extruded. After an extrusion operation, it is simply necessary to retract the gag means with the billet held therein. The extruded product may then be severed from the material held in the gag means and the container reloaded for another extrusion operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the indirect extrusion press of the present invention;

FIG. 2 is an enlarged cross-sectional view of the improved gag means of the present invention; and

FIG. 3 is a side elevation of an alternative embodiment of the gag means of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1, the indirect extrusion apparatus includes die assembly **1**, a container **2** for holding a billet of material in alignment with the die assembly and gag means **3** for moving the container over the container and the billet material therethrough. Except for the gag means **3**, the construction of the press shown in FIG. **1** may be the same as the press disclosed in applicant's copending application, Ser. No. 89,841, filed Nov. 16, 1970. Generally, the die assembly **1** is mounted at one end to a platen **4** and at its other end holds a die means **1'** through which the billet material is to be extruded. The container **2** is mounted for reciprocal movement on suitable guide structure **5** and has a bore **6** in which the billet of material to be extruded is loaded. The bore is axially aligned with the die assembly so that the container may be telescoped over the die assembly during an extrusion operation. The gag means in the form of a gag block **3'** engages against the end of the container remote from the die assembly and die means and is mounted on the end of a hydraulically actuated ram **7**. At the end of the container remote from the die assembly there is positioned a cutting device **8** having a cutting blade **9** adapted to be moved across the bore of the container for severing the extruded product as more fully described below. Finally, suitable heating means **10** are provided for heating the container and thus the billet material to be extruded.

In accordance with the teachings of the present invention, the gag block **3'** has a cavity **11** in its front surface facing and in alignment with the bore **6** of the container. In the presently preferred construction the cavity has a cross-sectional shape and size equal to the cross-sectional shape and size of the bore through the container. Also, its depth is equal to the length of the butt that would normally be produced with conventional indirect extrusion presses. Generally, this depth will be about one-tenth the length of the billet material being held in the container. This depth is sufficient to absorb the flow of billet material which occurs during the extrusion of all of the material held within the container without interfering pressure reaction from the bottom surface of the cavity. In order to further assure distortion free extrusion of the entire material of the billet held in the container, the gag means is insulated and heating means **12** are provided so that the temperature of the material in the gag structure may be maintained generally at the same level as the temperature of the material in the container.

In operation of the improved indirect extrusion press of the present invention, a billet of material is first loaded into the container **2**. The hydraulic ram is then

actuated to move the gag block 3' over the aligned bore 6 of the container and into contact therewith. The container with the billet is then forced forwardly toward the die assembly to bring the die means 1' into contact with the billet. With continued movement of the container in this direction, the billet is first moved partially out of the end of the container remote from the die assembly and into the cavity 11 of the gag block. Due to the engagement of the gag block with the container and the alignment of the cavity 11 with the bore of the container, the material moved into the cavity is confined. Continued movement of the container over the die assembly effects extrusion of the billet material through the die means 1'. At the same time, the pressure created during this extrusion and, in particular, during extrusion of the final portion of the billet material held in the container, causes the material held within the cavity 11 to flow tightly into engagement against the cavity walls. Thus, the material in the cavity will be held therein by frictional engagement of the walls with the cavity.

After the container has been completely telescoped over the die assembly, the die means 1' will be generally aligned with the end of the container adjacent the gag means and may even be oriented slightly in the cavity 11. The gag means is then retracted; and due to the billet material being held in the cavity, the extruded product is drawn backwardly through the die means 1'. Retraction is continued until enough room is provided for actuation of the cutting blade 9 which may then be operated to sever the extruded product from the billet material held in the gag means. In extrusion operations, it is not necessary to perform this separate cutting operation. The mere retraction of the gag means with the billet material held therein will cause the billet material to be severed from the extruded product. The frictional hold of the die means on the extruded product will be enough to hold product during retraction of the gag means and cause it to break away from the billet material in the gag means.

After the cutting operation, the severed product is removed from the die assembly and the container reloaded with a new billet of material. Each subsequent extrusion will effectively extrude an entire billet length of material while the cavity 11 will generally remain filled, with the billet material therein from the previous extrusion operations being replaced by new materials to the extent caused by the flow of the new materials into the cavity.

FIG. 2 shows an alternative embodiment of the present invention in which the cutting device 8 has been eliminated. In this construction, the gag means 3 is mounted on the end of the ram for movement transversely of the axis of extrusion. To effect this movement, suitable hydraulic means 13 is provided. With this construction, the extruded product may be severed from the billet material remaining in the gag block by simply actuating the hydraulic means 13 to move the gag block transversely of the container. This produces a shearing of the product from the remaining billet material.

The above description has been made of the presently preferred embodiments of the invention. Generally, the press is used for extruding light metals such as aluminum, magnesium and so forth. It may also be used, however, for extruding other metals and materials. Also, the shape and depth of the cavity in the gag block and/or the temperature of the material held thereby may be varied to produce different flow patterns as found to be desirable when extruding different metals and shapes.

I claim:

1. In an indirect extrusion press having die means through which material is adapted to be extruded, an open ended container for holding a billet of said material positioned on one side of said die means for telescoping movement thereover, and gag means at the end of said container remote from said die means having a surface for engaging against the remote end of the container and moving said container over said die means and the billet material therethrough, the improvement wherein:

a. said gag means has a cavity formed in said surface facing and aligned with the remote end of said container for receiving billet material, said cavity being disposed beyond the remote end of said container.

2. In an indirect extrusion press having die means through which material is adapted to be extruded, an open ended container for holding a billet of said material positioned on one side of said die means for telescoping movement thereover, and gag means at the end of said container remote from said die means for engaging against and moving said container over said die means and the billet material therethrough, the improvement wherein:

a. said gag means has a cavity therein facing and aligned with the remote end of said container for receiving billet material; and

b. the cavity in said gag means has a cross-sectional size as great as that of the bore through said container.

3. The improvement according to claim 1 wherein:

a. the cavity in said gag means has a depth equal to the length of the butt that would normally be required if the gag had no cavity therein.

4. In an indirect extrusion press having die means through which material is adapted to be extruded, an open ended container for holding a billet of said material positioned on one side of said die means for telescoping movement thereover, and gag means at the end of said container remote from said die means for engaging against and moving said container over said die means and the billet material therethrough, the improvement wherein:

a. said gag means has a cavity therein facing and aligned with the remote end of said container for receiving billet material; and

b. the cavity in said gag means has a depth sufficient to absorb the flow of billet material occurring on the one side of said die means during the extruding of all of the billet material within the container without interfering pressure reaction from the bottom surface of said cavity aligned with the bore of the container.

5. The improvement according to claim 4 wherein:

a. the cavity in said gag means has a cross-sectional shape generally corresponding to that of the bore through said container.

6. The improvement according to claim 5 further comprising:

a. heating means for heating the container and gag means to heat the billet material therein to substantially equal temperatures.

7. The improvement according to claim 4 further comprising:

a. means for shifting said gag means transversely of the axis of extrusion after extrusion of said material from the container to shear the billet material in the gag means from the extruded product.

8. The improvement according to claim 4 further comprising:

a. means for retracting said gag means after an extrusion operation from engagement with said container; and

b. cutting means for cutting the extruded product from the billet material held by said gag means after separation of said gag means and container.

9. In the indirect extrusion of a billet of material through die means where the billet is held in an open ended container positioned on one side of the die means, the improvement comprising:

a. confining billet material externally of the container at the end remote from said die means to close said end;

b. confining the billet material held by said container between the die means and the billet material at the remote end of the container; and

c. extruding the confined billet material held in the container through said die means.

10. The improvement according to claim 9 including:

a. confining at the remote end of the container billet material having a thickness sufficient to absorb the flow of material occurring on the one side of said die means during the extruding of all of the billet material within the container.

11. The improvement according to claim 10 including:

a. confining at the remote end of the container billet material of a cross-sectional shape generally corresponding to that of the billet material held in the container.

12. The improvement according to claim 11 further comprising:

a. moving the confined billet material at said remote end of the container away from the container after extrusion of the billet material held in the container; and

b. severing the extruded product from the confined billet material.

13. The improvement according to claim 11 further comprising:

a. maintaining the confined billet material at the remote end of the container at a temperature about equal to the temperature of the billet material held in said container during the extrusion operation.

14. In the indirect extrusion of a billet of material through die means where the billet is held in an open ended container positioned on one side of the die means, the improvement comprising:

a. moving the billet material into contact with said die means at one end of said container;

b. moving the billet material partially out the other end of the container into a confined area;

c. extruding the billet material remaining in the container through said die means; and

d. severing the extruded product from the billet material in said confined area.

15. The improvement according to claim 14 further comprising:

a. placing a second billet of material in said container after the extrusion of the first mentioned billet material;

b. placing the billet material held by said gag means during the previous extrusion against said other end of the container; and

c. extruding the second billet material held in the container through said die means.

* * * * *